



Instructions

for the



FM Wireless Microphone

Model SK-106

INTRODUCTION

Your Heathkit Model SK-106 Wireless Microphone kit contains all the parts necessary to build your own mini radio station, an FM Wireless Microphone. Once you complete the assembly of your Microphone, you need only tune it to a clear (unused) frequency within its 5 MHz tunable range on your FM receiver (88 to 108 MHz). Your Microphone then transmits your voice to the receiver, turning you or anyone using your Microphone into an instant radio personality.

This Manual includes step-by-step assembly, alignment, and operation instructions, a brief troubleshooting guide, and a schematic diagram. Refer to the SK-100 Educational Series Manual for circuit theory and a quiz.

Refer to the "Kit Builder's Guide" for additional information on:

- Parts identification.
- Tools.
- Wiring.
- Soldering.
- Step-by-Step Assembly procedures.
- Warranty and Customer Service information.

PARTS LIST

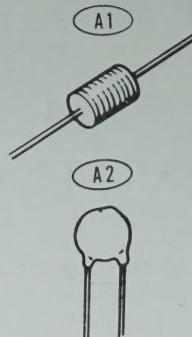
Unpack your kit and check each part against the following list. The key numbers correspond to those on the numbered illustrations.

To order a replacement part, always include the PART NUMBER. Use the Parts Order Form furnished with this kit.

KEY No.	HEATH Part No.	QTY	DESCRIPTION	CIRCUIT Comp. No.
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CAPACITORS

A1	28-2	1	1 pF (brn-blk-wht) phenolic	C8
A2	21-739	1	2.2 pF ceramic	C9
A2	21-3	1	10 pF ceramic	C11
A2	21-709	1	36 pF ceramic	C6
A2	21-738	1	68 pF ceramic	C7
A3	25-859	1	.47 μ F electrolytic	C1
A3	25-900	1	1 μ F electrolytic	C2

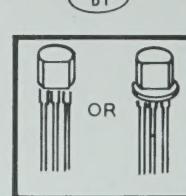
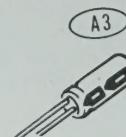


TRANSISTORS

NOTE: Transistors may be marked for identification in any one of the following four ways:

1. Part number.
2. Type number.
3. Part number and type number.
4. Part number with a type number other than the one shown.

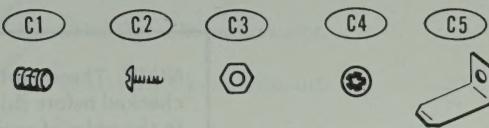
B1	417-293	1	2N5770	Q3
B1	417-874	1	2N3906	Q1
B1	417-875	1	2N3904	Q2



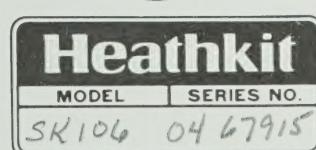
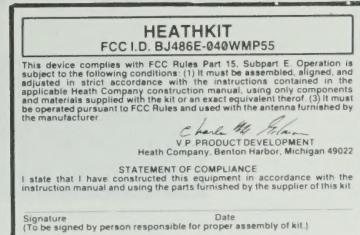
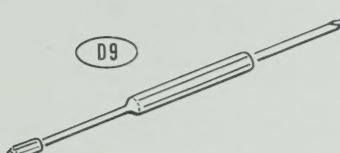
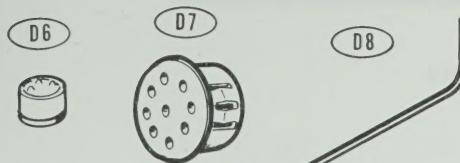
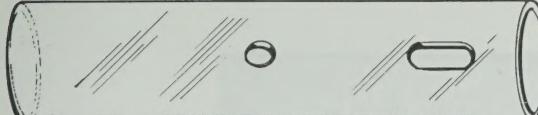
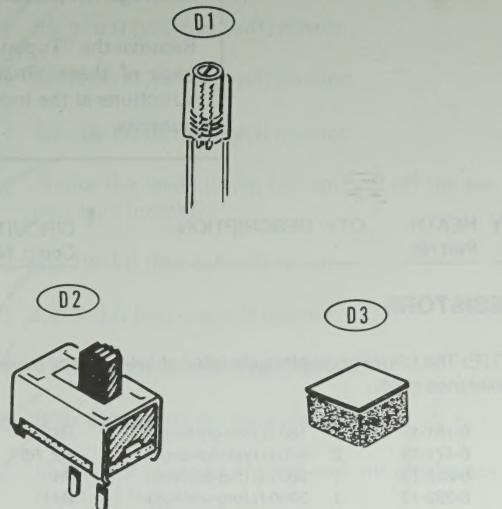
KEY	HEATH	QTY.	DESCRIPTION	CIRCUIT
No.	Part No.			Comp. No.

HARDWARE

C1 250-230 1 ✓ 6-32 x 3/16" setscrew
 C2 250-467 2 ✓ 2-56 x 3/16" screw
 C3 252-51 2 ✓ 2-56 nut
 C4 254-26 2 ✓ #2 lockwasher
 C5 258-5 2 ✓ Battery spring

OK**MISCELLANEOUS PARTS**

D1 40-1783 1 ✓ Coil
 D2 60-614 1 ✓ Switch
 D3 73-142 2 ✓ Foam pad
 85-3147-2 1 ✓ Circuit board
 D4 266-1265 1 ✓ Case
 340-2 3" Bare wire
 344-125 12" ✓ Black wire
 348-2 6" ✓ Magnet wire
 D5 390-2907 1 ✓ FCC label
 418-37 2 ✓ Battery, 1.5-volt, type A76
 D6 480-78 1 ✓ Microphone
 D7 485-62 2 ✓ Case end
 D8 490-14 1 ✓ Allen wrench
 D9 490-109 1 ✓ Alignment tool
 597-260 1 ✓ Parts Order Form
 597-4212 1 ✓ Kit Builder's Guide
 D10 1 ✓ Blue and white label
 ✓ Solder

*OK*L1
SW1

TAPED COMPONENTS

NOTE: These parts are taped on a strip which was checked before shipment. Since these parts are taped in the order of assembly, you may not wish to check them against the following list.

Remove the "Taped Component Chart" from the last page of these "Instructions." Then follow the instructions at the top of that chart to prepare the components.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION
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CIRCUIT Comp. No.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION
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CIRCUIT Comp. No.

RESISTORS

NOTE: The following resistors are rated at 1/4-watt and have a tolerance of 5%.

6-181-12	1	180 Ω (brn-gry-brn)	R12
6-471-12	2	470 Ω (yel-viol-brn)	R2, R5
6-202-12	1	2000 Ω (red-blk-red)	R1
6-392-12	1	3900 Ω (org-wht-red)	R11
6-682-12	1	6800 Ω (blu-gry-red)	R7
6-103-12	2	10 k Ω (brn-blk-org)	R3, R4
6-333-12	1	33 k Ω (org-org-org)	R8
6-104-12	2	100 k Ω (brn-blk-yel)	R6, R9

MISCELLANEOUS

21-784	2	.001 μ F (102) axial-lead ceramic capacitor	C4, C5
21-761	1	.01 μ F (103) axial-lead ceramic capacitor	C3
56-56	1	1N4149 diode	D1

STEP-BY-STEP ASSEMBLY

Refer to ~~Pictorial 1~~ for the following steps.

- (✓) Position the circuit board with its component side up as shown in the Pictorial.
- (✓) R1: Locate resistor outline R1 in the upper left-hand corner of the circuit board. Install a $2000\ \Omega$ (red-blk-red) resistor vertically at that location, as shown below. Solder the resistor leads to the circuit board foil as outlined on Page 1 of the "Kit Builder's Guide." Then cut off the excess lead lengths.



Install the remaining resistors in the following steps.
NOTE: Install each of the following resistors vertically. You will be instructed to solder these resistors later.

() R3: 10 k Ω (brn-blk-org) resistor.

() R4: 10 k Ω (brn-blk-org) resistor.

() R2: 470 Ω (yel-viol-brn) resistor.

() R5: 470 Ω (yel-viol-brn) resistor.

() R7: 6800 Ω (blu-gry-red) resistor.

() R6: 100 k Ω (brn-blk-yel) resistor.

() Solder the leads to the foil and cut off the excess lead lengths.

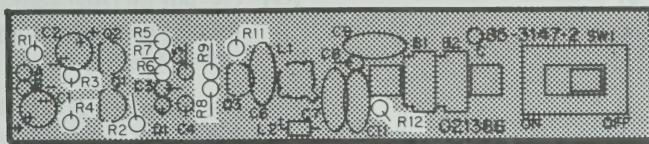
() R9: 100 k Ω (brn-blk-yel) resistor.

() R8: 33 k Ω (org-org-org) resistor.

() R11: 3900 Ω (org-wht-red) resistor.

() R12: 180 Ω (brn-gry-brn) resistor.

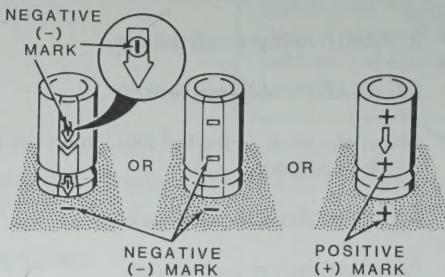
() Solder the leads to the foil and cut off the excess lead lengths.



PICTORIAL 1

Refer to Pictorial 2 for the following steps.

NOTE: Before you install an electrolytic capacitor, look at it and identify the leads. One lead will have either a negative (-) mark or a positive (+) mark near it on the side of the capacitor. (The marking for a negative lead may look like an oblong bar, sometimes with a circle around it, inside an arrow.) . . . Be sure to install the negative lead in the negative-marked hole, and the positive lead in the positive-marked hole.



(✓) C1: .47 μ F electrolytic capacitor.

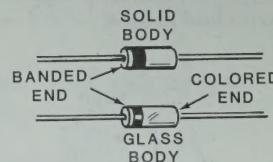
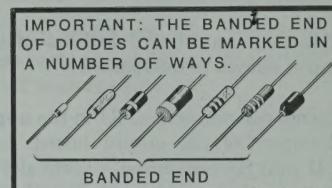
(✓) C2: 1 μ F electrolytic capacitor.

(✓) C3: .01 μ F (103) axial-lead ceramic capacitor. Install this capacitor vertically as you did the resistors. (NOTE: This part and the next three parts are on the taped component strip.)



NOTE: When you install a diode, always match the band on the diode with the band mark on the circuit board, or with the band position shown in the Pictorial. **The circuit will not work properly if a diode is installed backwards.**

If your diode has a solid body, the band is clearly defined. If your diode has a glass body, do not mistake the colored end inside the diode for the banded end. Look for a band painted on the outside of the glass.

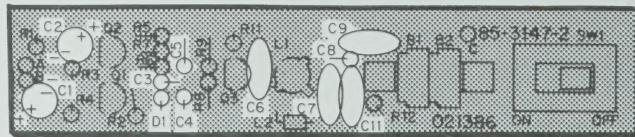


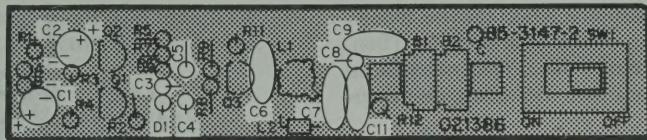
(✓) D1: 1N4149 diode (#56-56). Install the diode vertically, as you did the resistors, and position the banded end up.



(✓) C5: .001 μ F (102) axial-lead ceramic capacitor. Install this capacitor vertically as you did the resistors.

(✓) C4: .001 μ F (102) axial-lead ceramic capacitor. Install this capacitor vertically as you did the resistors.



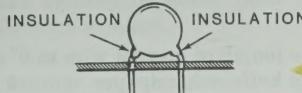


PICTORIAL 2

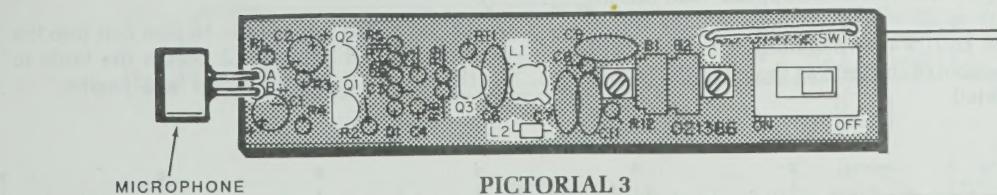
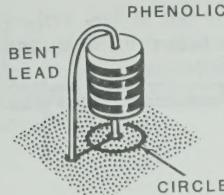
(Repeat)

NOTES:

- When you mount ceramic capacitors in the following steps, do not push the leads all the way through the circuit board holes. The leads have a coating of insulation that may keep you from making a good solder connection.
- In each of the next five steps, use a pair of long-nose pliers to carefully form the capacitor leads to fit the hole spacing on the circuit board. Otherwise, you may break the leads of the capacitor.



- C6: 36 pF ceramic capacitor.
- C7: 68 pF ceramic capacitor.
- C9: 2.2 pF ceramic capacitor.
- C8: 1 pF (brn-blk-wht) phenolic capacitor. Install this capacitor as shown below.



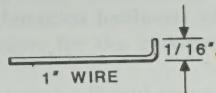
PICTORIAL 3

- C11: 10 pF ceramic capacitor.

- Solder the leads to the foil and cut off the excess lead lengths.

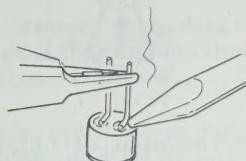
Refer to Pictorial 3 for the following steps.

- Cut two 1" lengths of bare wire and bend one end of each wire as shown below.



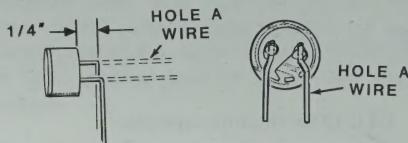
- Melt a small amount of solder on each foil pad of the microphone, and on the bent end of each 1" wire.

- Use a pair of needlenose pliers to hold the bent end of one wire against one foil pad on the microphone. Then heat the wire and foil pad with your soldering iron until the solder melts. Remove the soldering iron and allow the connection to cool before you release the wire.



- Similarly, solder the remaining wire to the remaining foil pad on the microphone.

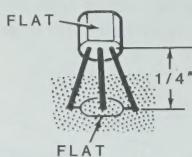
(✓) Position the microphone as shown below. Note the position of the hole A wire. Then, while holding the wires with needlenose pliers, bend them down $1/4"$ from the microphone body.



(✓) Insert the microphone wires into circuit board holes A and B as shown in Pictorial 3. Then carefully solder the wires to the foil and cut off the excess lengths.

(✓) Check the connections on the microphone to be sure they remained soldered. Resolder the wires if necessary.

NOTE: Whenever you install a transistor, as in the following step, position it so the flat side is over the flat of the outline on the circuit board, as shown. Then insert the leads into their circuit board holes and position the bottom of the case $1/4"$ above the board. Bend the transistor leads out slightly on the foil side of the board to hold it in place. Then solder the leads to the foil and cut off the excess lead lengths.

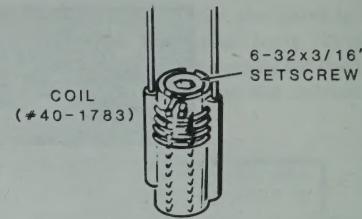


(✓) Q2: 2N3904 transistor (#417-875).

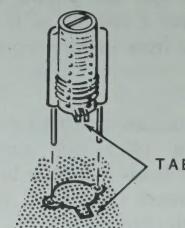
(✓) Q1: 2N3906 transistor (#417-874).

(✓) Q3: 2N5770 transistor (#417-293).

(✓) Using the allen wrench supplied with this kit, turn the $6-32 \times 3/16"$ setscrew into the bottom of the coil (#40-1783) until it is flush with the bottom of the form as shown in the following detail.

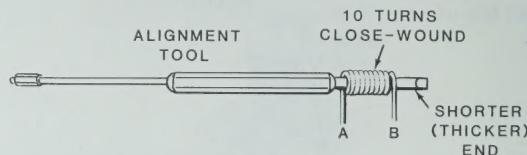


(✓) L1: Position the coil so its tab is over the outline of the tab on the circuit board. Then insert the coil leads into the proper holes and solder them to the foil.



(✓) Cut the length of magnet wire to 6" and, using a sharp knife or sandpaper, remove $3/8"$ of insulation off each end.

(✓) Refer to the detail below and wind 10 turns of wire (counting on the top of the coil) around the **shorter** end of the alignment tool. NOTE: Be sure to wind the coil around the alignment tool in the direction shown (starting at A and finishing at B).

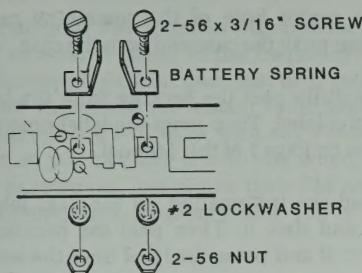


(✓) L2: Insert the leads of the 10-turn coil into the circuit board holes at L2. Solder the leads to the foil and cut off the excess lead lengths.



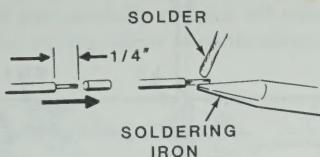
Heathkit

(✓) Refer to the detail below and mount two battery springs to the circuit board as shown.



(✓) SW1: Insert the leads of the switch into the circuit board holes at SW1. Be sure the switch is perpendicular to the circuit board and then solder the leads to the foil.

(✓) Cut the length of black wire to 10-1/2" and remove 1/4" of insulation from one end. Twist the fine strands of wire together and melt a small amount of solder onto the strands to hold them together.



(✓) Insert the prepared end of the wire into hole C and solder it to the foil. Cut off the excess lead length.

(✓) Insert the free end of the wire coming from hole C through the indicated hole of the circuit board and pull the remaining length of wire through. This will serve as a strain relief for the antenna.

CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following possible problems:

- (✓) Unsoldered connections.
- (✓) Poor solder connections.
- (✓) Solder bridges between foil patterns. NOTE: Refer to the "Circuit Board X-Ray View" if you are uncertain and want to see the correct foil patterns.
- (✓) Protruding leads which could touch together or touch other foil patterns on the circuit board.

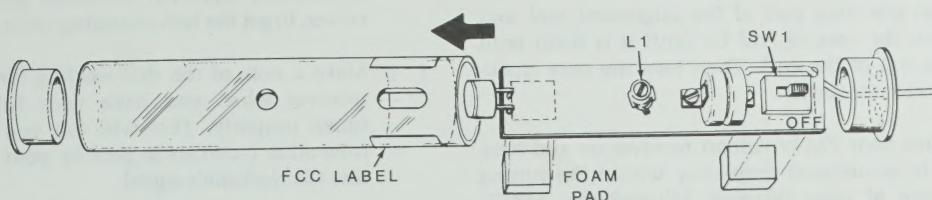
Refer to the illustrations where the parts were installed as you make the following visual checks:

- (✓) Transistors for the proper type and installation.
- (✓) Diode for proper positioning of the banded end.
- (✓) Electrolytic capacitors for the correct position of the positive (+) or negative (-) markings.

FINAL ASSEMBLY

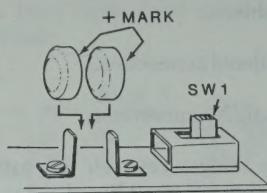
Refer to Pictorial 4 for the following steps.

- (✓) Carefully remove the backing from a foam pad. Then press the pad onto the foil side of the circuit board at one end.
- (✓) Similarly, install a foam pad to the foil side at the other end of the circuit board.
- (✓) Make sure switch SW1 is in the OFF position.



PICTORIAL 4

(✓) Install the two batteries into the battery springs as shown below. Position the positive (+) end of each battery toward switch SW1.



(✓) Position the case as shown in Pictorial 4. Then carefully slide the circuit board into the case. The small case hole should line up with the hole in L1, and the slide of SW1 should enter the case slot. NOTE: You may have to press down on the circuit board as you insert it to allow the slide of SW1 to enter the case slot.

(✓) Install a case end at the microphone end of the case.

(✓) Feed the free end of the antenna wire through the center hole of the remaining case end. Then push the case end onto the case.

(✓) Carefully peel the backing from the blue and white label. Then press the label onto an open area on Page 1 of this Manual.

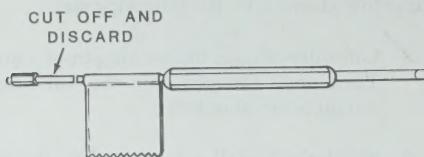
(✓) Read the information on the FCC label, sign it, and date it. Then peel the backing paper from it and press the label onto the end of the case.

This completes the "Step-by Step Assembly" of your FM Wireless Microphone. Proceed to the "Adjustments" section.

ADJUSTMENTS

NOTE: If you do not get the proper results from these adjustments, turn your Microphone off and refer to the "In Case Of Difficulty" section.

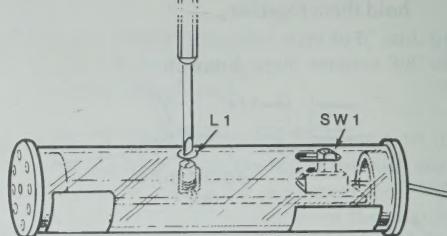
() Cut off and discard the indicated portion from the long end of the alignment tool. NOTE: After you complete the "Adjustments," you may store the alignment tool under the circuit board inside the case.



() Wrap a piece of tape (not supplied) around the indicated end of the alignment tool to use as a flag for counting turns.

() Use the long end of the alignment tool and turn the core of coil L1 until it is flush with the top of the coil. Then turn the core clockwise 1-1/2 turns.

() Turn your FM broadcast receiver on and tune it to an unused frequency within the tuning range of your Wireless Microphone. NOTE: You may have to temporarily disconnect any outside antenna from your receiver to find a clear spot.



() Turn your Microphone on. Then speak into the microphone while you carefully adjust coil L1 until you hear your voice coming over the receiver. You may have to be very close to your receiver to get a strong signal if you had to disconnect an antenna. NOTE: You may have to carefully tune L1, or retune your FM receiver, to get the best sounding audio.

() Make a note of the dial reading for your FM receiver when you have your Microphone tuned properly. This will tell you where to tune other receivers to pick up your FM Wireless Microphone's signal.

This completes the "Adjustments." Proceed to "Operation."

OPERATION

To operate your FM Wireless Microphone, be sure the FM receiver is tuned to the frequency noted in the Adjustments section. Then just turn your Microphone on to become an instant radio personality. Your Microphone will work with any FM broadcast receiver, so you can take it with you when you visit friends or relatives. Just retune their FM receiver to your Microphone's frequency and you're "on-the-air."

The range of your FM Wireless microphone will vary, depending on the position of its antenna. If your receiver antenna is horizontal, for example, to obtain maximum range, hold the Microphone antenna in the horizontal position also.

To change the operating frequency of your Microphone you need only find another clear frequency on the FM receiver and readjust L1 until your voice is clearly heard in the receiver.

NOTE: If coaxial (shielded) cable is used between the FM receiver and its antenna, it will greatly reduce the range of your FM Wireless Microphone. For best results, use a receiver with 300-ohm twin lead for its antenna connection.

This completes the "Operation" section.

IN CASE OF DIFFICULTY

This section of the Manual will help you determine the cause of any problems that might occur immediately after you have assembled your kit. We suggest that you carefully recheck all connections, reheating and adding solder to connections if neces-

sary. Refer back to the "Circuit Board Checkout," and carefully check all of the steps noted there. If you still have not found the problem, refer to the following "Troubleshooting Chart."

TROUBLESHOOTING CHART

PROBLEM	POSSIBLE CAUSE
No signal heard in receiver.	<ol style="list-style-type: none"> 1. Power switch is off. 2. Batteries installed wrong. 3. L1 adjusted too fast. 4. Q3 installed wrong, wrong part, or defective. 5. Microphone is too far from receiver.
Signal can be tuned in, but no audio (voice) is heard.	<ol style="list-style-type: none"> 1. Microphone installed wrong. 2. Q1 or Q2 installed wrong, wrong part, or defective part.

SPECIFICATIONS

Frequency Range	3.5 MHz tunable segment within the 88 to 108 MHz band.
Modulation	FM.
Deviation	100 kHz typical.
Range	Up to 50 feet, depending on receiver and antenna connections.
Power Requirements	3 VDC @ 3mA. (two type A76 watch batteries).
Dimensions	1" round × 5" long.
Weight	1.6 oz.

The Heath Company reserves the right to discontinue products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.

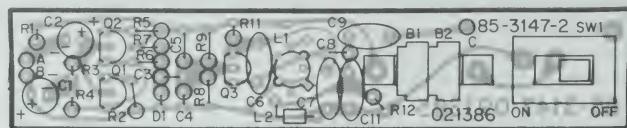
CIRCUIT BOARD X-RAY VIEWS

NOTE: To find the PART NUMBER of a component for the purpose of ordering a replacement part:

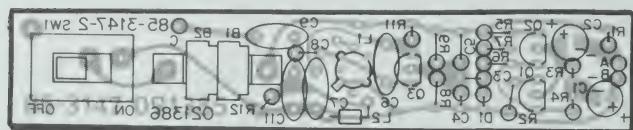
A. Find the circuit component number (R5, C3, etc.) on the "X-Ray View."

B. Locate this same number in the "Circuit Component Number" column of the "Parts List."

C. Adjacent to the circuit component number you will find the PART NUMBER and DESCRIPTION which must be supplied when you order a replacement part.

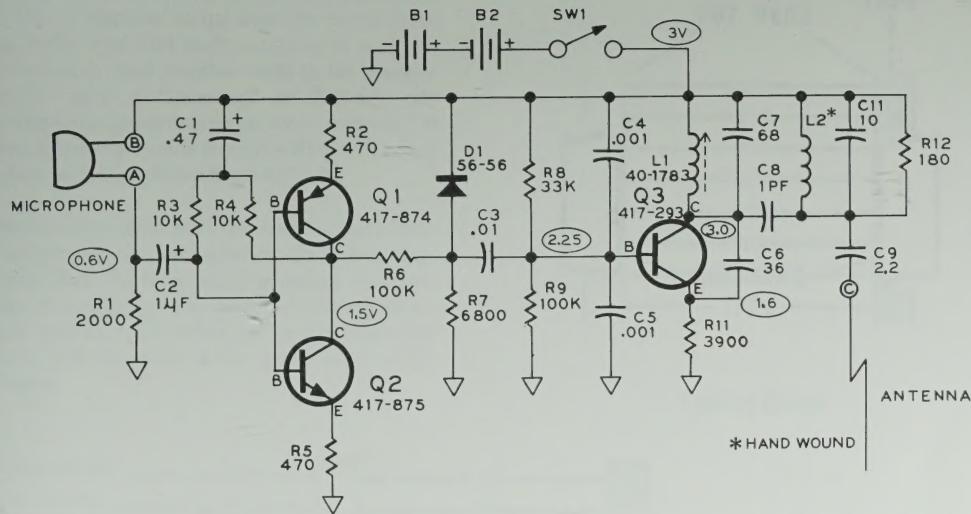


(Shown from the component side)



(Shown from the foil side)

SCHEMATIC



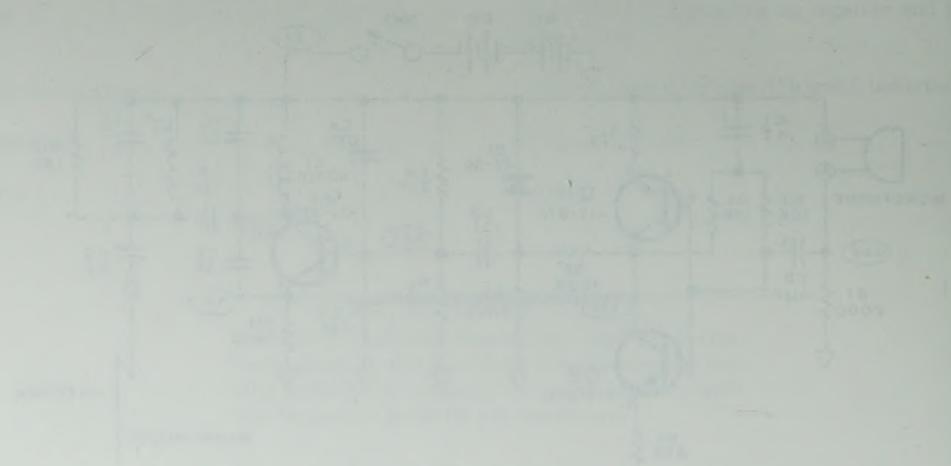
NOTES:

1. Resistors are rated at 1/4-watt and have a 5% tolerance. (K = 1000).
2. Capacitor values of 1 or less are in μF (microfarads); values greater than 1 are in pF (picofarads), unless otherwise noted.

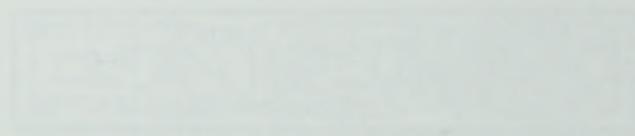
3. The following symbols are used:

- (A) This symbol indicates a circuit board wire connection.
- (∇) This symbol indicates a common connection to the negative side of the battery.
- (\circ) This symbol indicates a DC voltage taken from the point indicated to the negative side of the battery with a high input impedance voltmeter. Voltages may vary $\pm 10\%$.

OPTIONAL



1000-watt power supply (optional)

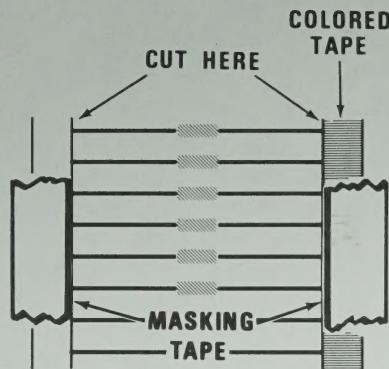


TAPED COMPONENT CHART

**Read and Follow These Instructions
Before You Install The First Component**

Use masking tape, as shown in the Taping Detail, to secure the component strips over the component drawings. Make sure that each component matches the color bands or part number next to its illustration. Cut the tapes, as necessary, so that you can properly align the components in each section. Do not remove any components from the strip until they are called for in the assembly instructions.

NOTE: Never attempt to pull the components from the tape unless you are instructed to do so in a step; gum residue from the tape could cause an intermittent solder connection. Use diagonal cutters to remove each part as it is called for in the assembly instructions. Cut the leads at the inside edge of the tape as shown.



Taping Detail

2000 Ω (red-blk-red) _____
10 k Ω (brn-blk-org) _____
10 k Ω (brn-blk-org) _____
470 Ω (yel-viol-brn) _____
470 Ω (yel-viol-brn) _____
6800 Ω (blu-gry-red) _____
100 k Ω (brn-blk-yel) _____
100 k Ω (brn-blk-yel) _____
33 k Ω (org-org-org) _____
3900 Ω (org-wht-red) _____
180 Ω (brn-gry-brn) _____
.01 μ F (103) axial-lead ceramic _____
1N4149 (#56-56) diode _____
.001 μ F (102) axial-lead ceramic _____
.001 μ F (102) axial-lead ceramic _____

